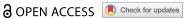


#### ORIGINAL ARTICLE



# Knowledge and attitudes towards mpox and effect of intervention among College of Applied Medical Sciences students

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#### **ABSTRACT**

Objectives: This research aims to assess the base level of knowledge and attitude of Applied Medical Sciences Students regarding mpox and whether an educational intervention could improve their knowledge and attitude.

Methods: A quasi-experimental research was used, involving 960 medical students from Applied Medical Sciences College at Prince Sattam Bin Abdulaziz University, KSA. They were recruited from the beginning of November 2022 till the mid of January 2023 based on the non-randomized sampling method. A standardized, anonymous, and closed-ended questionnaire was used, compromising three main sections: participants' demographics, knowledge, and attitudes toward the mpox epidemic.

**Results:** Total knowledge scores of the studied sample in the pretest phase were  $45.43 \pm 6.29$ compared to  $65.03 \pm 2.93$  in the post-test phase. Besides, total attitude scores were  $48.62 \pm$ 4.78 before program implementation, while after conducting the program reached 70.65  $\pm$ 5.13. There was a notable improvement in the total knowledge score of the sample studied after the intervention was implemented, particularly for neurological manifestations.

**Conclusion:** After the program's implementation, there was an obvious improvement in the medical students' total knowledge and attitude scores concerning the mpox epidemic. It is necessary to initiate well-organized training initiatives for all other medical faculties, paramedics, and applied health institutions in Saudi Arabia.

#### **ARTICLE HISTORY**

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#### **KEYWORDS**

Attitude; educational program; knowledge; mpox; neurological; nursing

### 1. Introduction

The outbreak happened in May 2022. Mpox cases have been discovered since the year's commencement in more than 100 nations and throughout all six World Health Organization regions [1]. According to the WHO, over 61,000 cases of mpox have been confirmed in the laboratory as of 19 September 2022 [2]. The majority (11 638/15 328, or 76% of the cases) were reported by countries in the WHO European Region, followed by the Region of the Americas (22%, 3316/15 328), the African Region (2%, 301/15 328), the Western Pacific Region (1%, 53/15 328), the Eastern Mediterranean Region (1%, 18/15 328), and the Region of South-East Asia (1%, 2/15 328) [3].

The zoonotic mpox disease is brought on by the double-helix DNA virus known as the mpox virus (mpoxv), which is a member of the Poxviridae family and a subfamily of the Chordopoxvirinae and Orthopoxvirus genera. This gene causes cutaneous manifestations of diseases including smallpox (produced by the smallpox virus), smallpox, camelpox, and mpox in humans. The most typical signs of mpox infection in people include fever, swollen lymph nodes, tiredness, chills, back pain, and skin rashes [455.

Given the potential risks associated with mpox outbreaks and the importance of educating medical university students about infectious diseases; an interactive health education program focused on mpox could be a valuable tool for promoting awareness and prevention of the disease [6]. This program could incorporate information on the signs and symptoms of mpox; methods of transmission; and strategies for prevention and treatment [7]. In addition, the interactive health education program could address common misconceptions about the disease and provide opportunities for medical students to practice and reinforce their knowledge through hands-on activities and group discussions [8].

Overall; the health education program for university medical students on the mpox outbreak has the potential to improve knowledge; attitudes; and behaviors related to preventing and controlling infectious diseases in this important population [9]. Prevention of mpox primarily involves avoiding contact with infected animals and practicing good hygiene, such as washing hands frequently and avoiding close contact with individuals who are sick [10]. In addition, vaccination against the disease is available in some areas and may be recommended for individuals who are at high risk of exposure, such as laboratory workers or healthcare personnel [11]& [12].

Educating university medical students about mpox is important for several reasons [13]. First, university medical students are demographics that are at risk of exposure to infectious diseases; particularly those who travel or study abroad in areas where mpox is endemic [14]. By educating university medical students about the risks and prevention of mpox; they can take appropriate measures to protect themselves and prevent the spread of the disease [15]. Second; university medical students are often in a position to disseminate information about mpox to their peers; families; and communities [16].

By providing information on mpox to university medical students, they can act as ambassadors and champions for disease awareness and prevention, promoting healthier and safer communities [17]. Thirdly, university medical students may be exposed to mpox as part of their academic or extracurricular activities. For example, students studying biology or health sciences may be exposed to the mpox virus in a laboratory setting, while students participating in outdoor activities may be at risk of exposure through contact with wild animals [18]. Furthermore, University medical students can take appropriate measures to reduce their risk of exposure to mpox and protect themselves and others by being informed on the hazards and prevention of the diseases [19].

### 1.1. Aim of the study

To assess the basic level of knowledge and attitude of applied medical science students regarding mpox and whether an educational intervention could improve their knowledge and attitude.

#### 2. Methods

### 2.1. Setting

The study was conducted at the College of Applied Medicine, Prince Sattam Bin Abdulaziz University, Alkharj, Kingdom of Saudi Arabia.

# 2.2. Study design

A pre/posttest quasi-experimental research methodology was used.

# 2.3. Subjects and sample size

A total of 960 students who are enrolled in healthrelated courses or programs at the College of Applied Medical Sciences in Saudi Arabia and are university medical students between the ages of 18 and 25, free from any physical and psychological problems and available at data collection made up the participants. Participants were attracted by way of brochures, social media, and email invitations to relevant departments, and student organizations. English proficiency and a willingness to give informed consent were requirements for participation. Using a nonrandomized sampling technique (purposive sampling), participants were selected based on their availability and interest in participating.

### 3. Tools of data collection

A structured, anonymous and close-ended questionnaire was modified based on recent data from the Central for disease and control prevention (CDC) in the United States and a previously published study [13,13,20,21]. The instrument was divided into three sections: (I) sociodemographic data; (ii) an evaluation of the studied samples' knowledge about the mpox virus; and (iii) an evaluation of the studied samples' attitudes toward the mpox virus.

The first part of the questionnaire evolved sociodemographic details, such as age, gender, educational level, academic year, history of human chickenpox, grade point average (GPA), and educational levels of their parents.

The following 43 questions made up the second section of the questionnaire. All 43 questions required the participants to select one of the following three options, 'Yes,' 'No,' or 'I don't know.' On the 43 questions evaluating the respondents' knowledge of human mpox, a score of '1' was given for accurate responses and a score of '0' for unreliable responses. For each participant, the sum of these scores was used to generate a number between 0 and 43. Based on this grade, a percentage between 0% and 100% was then calculated. The percentages were computed by dividing the participant's total number of accurate responses by 43, then multiplying that result by 100. The score for the difference in knowledge was calculated using the Mean and SD.

Finally, ten statements on a five-point Likert scale were used to evaluate perceptions about mpox (strongly disagree, disagree, neutral, agree, and strongly agree). The purpose of these statements is to regard respondents' views toward increasing their understanding of the mpox virus, travel, health, and new infectious diseases. Neutrality received a score of 3, disagreement a score of 2, extreme disagreement a score of 4, and strong agreement a score of 5. Strong disagreement received a score of 1. The attitude score difference was calculated using the Mean and SD.



### 3.1. Reliability and validity of the questionnaire

To develop the questionnaire, the authors of this study combed through all available prior research on 'mpox virus epidemiology' and 'mpox knowledge and attitudes.' Up until 20 October 2022, published research was searched in a variety of databases, such as EMBASE, Cochrane Library, and PubMed, as well as on the CDC, WHO, and Google Scholar websites. The questionnaire was created using the most pertinent literature [13]. The translation back-translation approach was used to assess the questionnaire's content validity. A bilingual expert back-translated the questionnaire into Arabic (the local language) after it was initially written in English to ensure uniformity and reduce bias. Additionally, seven public health researchers who are authorities in the related domains verified the content's validity. To make sure there were no unclear questions, the survey was piloted with 96 medical students (the results were not included in the final analysis). By utilizing Cronbach's alpha to assess the questionnaire's internal consistency, it was discovered that it had a respectable level of reliability (Cronbach's alpha = 0.88).

# 3.2. Procedure

The study was conducted in compliance with ethical principles, as it was approved by the Standing Committee on Bioethics Research (SCBR-069-2023) and informed consent was obtained from participants. Data collection took place over 3 months, from November 2022 to January 2023. The study was divided into four phases: assessment, program development, implementation, and evaluation.

During the assessment phase, the researchers provided oral instructions to the students, explaining the study's objectives and the various components of the instruments used. In the program development phase, the researchers developed an instructional program based on the data from the initial evaluation and literature. The program covered all topics related to the mpox pandemic in a straightforward booklet written in easy Arabic and containing several color illustrations. The program consisted of four sessions in total, with the researcher providing an overview of the program's objectives during the first session. The second session covered the triple risk model, mpox risk variables, and prevention recommendations, while the third session instructed the students on mpox prevention techniques. During the fourth session, the researcher and the students had a conversation about how to implement the recommended guidelines for maintaining a safe environment free of pox and other epidemic diseases. The researcher expressed gratitude to the participants for attending the study sessions.

During the implementation phase, 10 groups of 25 students each were formed from the participating

students. The program was delivered throughout four sessions, with each group receiving three sessions per week for a total of approximately 1 hour per session. The groups were given a total of 90 hours (10 groups  $\times$ 9 hours) to complete the training. The students were provided with an orientation regarding the program sessions' timing, location, duration, and content, with the researcher emphasizing the importance of consistent attendance and engaged engagement. The program included a variety of teaching and learning techniques, including interactive lectures, group discussions, demonstrations and re-demonstrations, instructional materials such as data shows and lab models, and printed handouts.

In the evaluation phase, the pre- and post-mpox instructional guidelines' intervention was analyzed to determine whether the study's objectives were met. The phase focused on evaluating the impact of the guidelines' intervention. This phase was completed 1 month after the program's launch.

# 4. Data analysis

The collected data were analyzed using the Statistical Package for Social Sciences (SPSS) version 26.0 (IBM Corp.; Armonk; NY; USA). The data were summarized using descriptive statistics, including frequencies; percentages; means; and standard deviations. The normality of the continuous data was checked using the Shapiro-Wilk test, and the data was found to be normally distributed. The respondents' knowledge scores and attitude scores were calculated by summing the responses to the relevant items and then dividing by the total number of items. The knowledge and attitude scores were presented as means and standard deviations. The differences in knowledge and attitude scores were compared between different groups using the independent t-test or one-way analysis of variance (ANOVA).

A multivariate logistic regression analysis was used to identify the predictors of adequate knowledge and positive attitudes toward mpox among nursing students. The dependent variable was knowledge and attitude scores, dichotomized as adequate knowledge (scores  $\geq$ 75%) and positive attitude (scores  $\geq$ 60%). The independent variables were gender; age; academic year; history of chickenpox; GPA; and parents' educational level. Odds ratios (ORS) with 95% confidence intervals (CIs) were computed to estimate the strength and direction of the association. The level of significance was set at P < 0.05.

# 5. Results

Table 1: shows that 50.8% of the studied sample aged 20 + years old, with Mean $\pm$  SD of 20. 8  $\pm$  13. 5, 56% are female and 48% are in the 3<sup>rd</sup> academic year. Besides, the findings revealed that 64% of the studied sample



Table 1. Distribution of studied sample according to personal characteristics (n = 960).

Personal characteristics	Frequency	Percent
Age:		
<20	472	49.2
20+	488	50.8
Range	18–2	5
Mean± SD	20.8±1	3.5
Median	21.0	1
Gender:		
Male	422	44
Female	538	56
Educational years:		
2 <sup>nd</sup> year	230	24
3 <sup>rd</sup> year	461	48
4 <sup>th</sup> year	269	28
History of chickenpox:		
Yes	346	36
No	614	64
Last GPA (out of 5):		
<2.5	215	22.4
2.5-3.74	342	35.6
≥ 3.75	403	42
Father's education:		
< University level	572	59.6
≥University level	388	40.4
Mother's education::		
< University level	668	69.6
≥University level	292	30.4

had no previous history of chickenpox and 42% had ≥3.75 as the total last GPA. Also, the table indicated that 59.4% and 69.6% of the studied sample fathers and mothers had <university-level education, respectively.

Data presented in Figure 1 suggests that the majority of people (58%) rely on social media as their primary source of information about mpox; followed by TV/ Radio (20%); health campaigns (9%); family/friends (6%); and healthcare providers (7%). This highlights the significant impact that social media has on the spread of information and the need for reliable sources of information.

Table 2 asserts that the overall knowledge score on mpox dramatically increased from 45.43 ± 6.29 before the intervention to  $65.03 \pm 2.93$  after it. Before and after the program's implementation, there were highly statistically significant differences in the studied sample's knowledge of mpox at (p < 0.001).

Table 3 illustrates that total attitude scores were  $48.62 \pm 4.78$  before program implementation, while after conducting the program reached  $70.65 \pm 5.13$ . Additionally, the findings showed that there were high statistically significant differences in the studied sample's attitudes toward mpox at (p < 0.001).

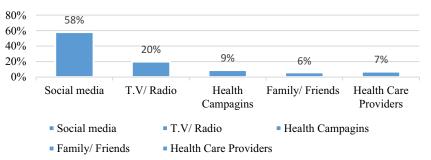
Table 4: shows the results of multiple linear regression analysis of the knowledge score of the studied sample. The model includes two predictor variables: intervention and education. The results indicate that both intervention and education are significant predictors of knowledge scores. Specifically, the intervention variable has a positive coefficient of 39.71; indicating that participants after the intervention had higher knowledge scores. The education variable also has a positive coefficient of 2.43; indicating that higher levels of education are associated with higher knowledge scores. The model has a relatively high R-square value of 0.61; indicating that 61% of the variability in knowledge scores can be explained by the model. The ANOVA results indicate that the model is statistically significant; with an F-value of 109.76 and a p-value less than 0.001; suggesting that the model fits the data well.

Table 5: presents the results of the best-fitting multiple linear regression model for the attitude score. The model includes two predictor variables: intervention and education. The results show that the intervention variable is a significant predictor of the attitude score (p < 0.001); with a standardized coefficient of 0.32. This means that the intervention had a positive effect on the attitude score. On the other hand, education was found to have a non-significant negative effect on the attitude score (p = 0.054) with a standardized coefficient of -0.16. The R-squared value of the model was 0.11; indicating that the model explains only a small proportion of the variance in the attitude score. The model ANOVA shows that the overall model was significant (p < 0.001), indicating that the model as a whole was a good fit for the data.

#### 6. Discussion

The spread of infectious diseases and epidemiology in the recent period has led to the need for continuous awareness about the dangers of the spread of these diseases, and we know so far that the current study is the first study among university medical students in one of the Gulf states using the pre- and post-

# Sources of information about mpox



**Figure 1.** Sources of information about mpox (n=960).

Table 2. Difference in knowledge scores about mpox of studied sample pre- and post-intervention (N = 960).

	Pre	Post		Р
Parameter	Mean and SD	Mean and SD	T-test	value
General awareness about mpox	15.7±7.0	33.8±33.1	70.21	≤0.001
Mode of transmissions	$7.42 \pm 1.58$	12.79 ± 1.43	46.13	≤0.001
Clinical signs and symptoms	$87.22 \pm 6.33$	138.28 ± 5.94	107.19	≤0.001
Neurological signs and symptoms of mpox	90.76 ± 7.12	142.40 ± 2.13	32.89	≤0.001
Prevention and management	$36.33 \pm 3.61$	$53.33 \pm 0.82$	85.54	≤0.001
Total mpox knowledge	45.43±6.29	65.03±2.93	117.56	≤0.001

Table 3. Difference in attitude scores of the studied sample toward mpox pre- and post-intervention (N = 960).

Parameter	Pre Mean and SD	Post Mean and SD	T-test	P value
I am confident that the worldwide populace will be able to stop the spread of the mpox virus.	3.65±0.97	4.56±0.50	33.03	≤0.001
I think there are sufficient prevention and control methods for the mpox virus.	3.74±0.62	4.52±0.54	38.27	≤0.001
I have negative feelings about the mpox virus and its neurological complications	3.85±0.75	4.59±0.49	32.56	≤0.001
The healthcare systems of the affected countries are under additional strain, in my opinion, as a result of the mpox virus.	3.87±0.67	4.65±0.48	38.70	≤0.001
I think that the mpox virus can be transmitted to KSA and can cause many neurological diseases	3.84±0.77	4.63±0.48	34.86	≤0.001
I think that the mpox virus's global prevention efforts may be influenced by media coverage of the disease.	3.82±0.54	4.65±0.48	47.78	≤0.001
In my opinion, the mpox virus will cause a new pandemic with effects similar to COVID-19.	3.88±0.59	4.61±0.49	39.30	≤0.001
I want to understand more about the epidemiology of recently discovered diseases.	3.86±0.64	4.55±0.53	33.61	≤0.001
I think a travel medicine course ought to be a prerequisite for medical school.	3.74±.55	4.44±0.53	38.34	≤0.001
I think it's unsafe to travel to places where the pox virus is present.	3.43±0.53	4.39±.54	51.26	≤0.001
Total attitude scores	48.62±4.78	70.65±5.13	85.09	≤0.001

**Table 4.** Best fitting multiple linear regression model for the knowledge score (n = 960).

		dardized icients					nfidence al for B
Variables	В	STD. error	Standardized coefficients	T-test	P-value	Lower	Upper
Constant	-31.29	5.71		-5.479	<0.001	-42.58	-20.00
Intervention	39.71	2.72	0.77	14.616	< 0.001	34.34	45.09
Education	2.43	1.00	0.13	2.425	0.017	0.45	4.41

R-square=0.61.

Model ANOVA:F=109.76, p<0.001.

**Table 5.** Best fitting multiple linear regression model for the attitude score (n = 960).

Unstandardized coefficients		Standardized			95% Confidence interval for B		
Variables	В	STD. Error	coefficients	T-test	P-value	Lower	Upper
Constant	60.05	3.46		17.340	< 0.001	53.20	66.90
Intervention	8.71	2.18	0.32	3.991	< 0.001	4.40	13.03
Education	-9.16	4.70	-0.16	-1.947	0.054	-18.46	0.14

R-square = 0.11.

Model ANOVA:F = 9.86, p < 0.001.

intervention program, and therefore this research was done to find out the effect of the educational program provided to university medical students about mpox; The World Health Organization (WHO) declared the human pox infection a public health emergency of global concern on July 23; 2022 [22]. Human mpox cases have recently increased; highlighting the need for early detection; quick action; and preventive management to stop it in its tracks [23].

The present study aimed to evaluate the effectiveness of an educational intervention program on the knowledge and attitude of university medical students towards mpox. The findings of this study showed an obvious improvement in the total knowledge score of the studied sample after the implementation of the health education program, especially for neurological signs and symptoms. Also, there were disparities in the study sample's knowledge of mpox that were extremely statistically significant. Additionally, multiple linear regression analysis revealed that intervention and education level were significant predictors of knowledge scores.

Since mpox is a re-emerging infectious illness and has not been reported in many countries, it should not be surprising from the researcher's perspective that the studied sample was generally unaware of the disease during the pre-test period. Another explanation for this occurrence could be that Saudi Arabian medical students may be preoccupied with studying common illnesses due to time restrictions. Because of this, it is not anticipated that medical graduates will be fully equipped to manage or treat this illness.

Besides, the young age of the studied sample and the higher percentage of parents without a university degree may also play a role in the sample's lack of familiarity with a novel pox virus. The majority of the studied sample used social media to learn about the pox virus, which is oftentimes a double-edged sword because it may also contribute to the adoption of misconceptions and the spreading of rumors and false information about the nature of the disease. Although there is no proof to support these assertions, these rumors, which were widely disseminated on social media, linked the mpox virus to COVID-19 vaccines out of concern for governmental restrictions or lockdowns. Also, this deficiency may be the result of the neglect of their ward responsibilities, their disinterest in seminar or lecture sessions, or their reluctance to read about new or reemerging diseases

The findings of the current study are consistent with the existing literature that emphasizes the significance of educational interventions in improving knowledge and attitudes toward infectious diseases. The positive impact of the educational intervention in this study could be attributed to its comprehensive and interactive nature, which incorporated various teaching methods and strategies, including lectures, group discussions, and role-playing. Such interventions are effective in enhancing knowledge and attitudes toward infectious diseases in previous studies 24,[25].

Besides, Queeni, Jain, and Malviya [26] detected that the mean difference between pre-test knowledge and post-test knowledge score was 8.78, which indicated an increase in knowledge score after undergoing structured teaching program about mpox. Moreover, Alshahrani, et al. [13] showed that contemporary medical students have little understanding of the mpox virus. Because controlling outbreaks necessitates a great deal of collaboration from knowledgeable and trained healthcare providers, this finding underscores the urgent need to expand their understanding.

Also, Jairoun et al. [6] found that the participant's understanding of the epidemiology, symptoms, and treatments for mpox is quite inadequate. Therefore, boosting the ability to respond to human mpox cases and to communicate pertinent information to a disease surveillance system will require greater knowledge of mpox. Moreover, Bates and Grijalva [9] indicated that Interventions in clinical education should address doctors' lack of knowledge to enable accurate diagnosis and treatment. Increased awareness of the danger that mpox poses to the public may encourage people to follow preventative advice.

Additionally, Peng, et al. [27] showed that the student's understanding of the resurgent mpox epidemic was poor. The majority of them responded well when asked about the disease's cause, incubation period, natural host signs and symptoms, mode of transmission, preventive measures, and treatment, but it was clear that they were perplexed when asked how to distinguish between a suspected, probable, or confirmed case and make a firm diagnosis. A series of lectures, seminars, and group discussions should be planned for them as a result to increase their comprehension, awareness, and use of preventative measures. Posters and hoardings addressing the concepts of hand hygiene, disease identification, isolation, and treatment ought to be done to improve things.

Furthermore, Roess, et al. [28] indicated that the findings imply that the existing program of film-based educational activities helps enhance knowledge concerning disease-specific issues and may motivate people to seek out medical advice when mpox is detected. Moreover, Swed, et al. [29] demonstrated that medical students and healthcare workers in the Arab world are more concerned with the COVID-19 virus than the mpox virus. Most medical practitioners have a basic understanding of the mpox virus. It was clear that healthcare personnel had poor views toward adhering to mpox virus preventive procedures in addition to having a low desire to receive the mpox immunization. It is essential to establish regulations for the medical staff and to take safety precautions. It is recommended that medical professionals undergo proper awareness training to explain the risks of failing to recognize all aspects of mpox. It is also critical to create rules for medical staff and implement prevention measures for mpox.

In the same vein, the findings of the study showed that there was a remarkable increase and improvement in the total attitude of the studied sample regarding mpox after implementing the educational program in the post-test phase. This result confirms the fact that there is a close link between knowledge and attitude, where the less knowledge, the lower the attitude, and vice versa, as found in a lot of scientific research. Also, the intervention was a significant predictor of attitude scores. This finding was matched with [30], who concluded substantial knowledge gaps and erratic perception/attitude of mpox risks, underscoring the need for mpox awareness campaigns for first-line Italian health care providers.

Additionally, Zehra et al. [31] concluded that medical students have a restricted attitude, knowledge, and perception of mpox infection. As a result, steps should be taken to set up awareness programs and educational courses at the institutional and governmental levels.

Likewise, during the 2022 mpox outbreak, Ahmed et al. [32] revealed that individuals had no strong opinions about mpox. Even if mpox has not spread widely, there were reports of negative views. The participants' mostly negative attitudes reveal the negative and preconceived consequences of COVID-19 on this segment of the public. The COVID-19 epidemic has left us with 'wounds that are exceedingly deep, seemingly longlasting, and still influence us,' as Yoo [33] puts it. Accordingly, Ibrahim, et al. [34] revealed that all studied



nursing students had low levels of knowledge, practice, and attitude before the program's implementation. After the program's execution, a highly statistically significant improvement in their knowledge, attitude, and practice was found.

Besides, the results elaborated that education level is a significant predictor of knowledge scores and is consistent with previous research that has highlighted the important role of education in promoting knowledge and awareness of infectious diseases (Kim, Shin, and Lee, 2022). In the current study; higher education level was associated with higher knowledge scores; indicating that education may play a critical role in promoting understanding and awareness about mpox. The results of this study are in line with previous studies that found education to be a predictor of knowledge about infectious diseases [25].

Additionally, the finding that education level does not significantly predict attitude scores toward infectious diseases in university students is noteworthy. Previous research has suggested that education can play a role in shaping attitudes toward infectious diseases [35]. For example, Rogers, Bahr, & Benjamin [36] found that higher education levels were associated with more favorable attitudes towards the influenza vaccine. Additionally, Roga, Bekele & Gonfa [37] reported that higher education levels were associated with greater compliance with COVID-19 prevention measures. Therefore, the current study's finding that education level did not predict attitudes toward infectious diseases in university students suggests that other factors may be more influential in shaping attitudes in this population.

### 6.1. Conclusion and recommendation

The knowledge and attitude of the studied samples were subpar, but once the educational program was put into place, there was a noticeable increase in both areas. Furthermore, pre-/post-educational program implementation changes were very statistically significant. As a result, the educational program's implementation was very successful in achieving its aims and objectives concerning improving the knowledge and attitude of the study sample. It is essential to receive training in this area as well as more in-depth ongoing education regarding any possible emerging diseases. Evaluation of knowledge is essential, particularly when research shows a significant increase in related and specialized knowledge, as was the case with prior epidemics and pandemics like Zika and COVID-19

### **Abbreviations**

MoHAP Ministry of Health and Prevention

**MPXV** Monkeypox virus

WHO World Health Organization.

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# Data availability statement

The data underlying this article is available in [Mendeley Data repository, doi:10.17632/jx4wksk4gp.1] and will be published once the paper is accepted at this link: http:// dx.doi.org/10.17632/jx4wksk4gp.1.

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